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XX.

OBSERVATIONS OF VARIABLE STARS IN 1886.

By Edward C. Pickering.

Communicated March 9, 1887.

The present publication is the fourth in a series of annual statements relating to variable stars, which was begun in 1884. In the fifth statement, to be published in 1888, it is proposed to review the entire period since the discovery of each variable star, giving the number of observations made by each observer during each year, so far as this information can be obtained. All persons who have any facts of this kind at command are urgently requested to communicate them to the Observatory of Harvard College, so that the proposed publication may be as complete as possible.

Some difficulty has been experienced in preparing the present report, from the circumstance that variable stars are occasionally designated only by letters and constellations, without their numbers in any published catalogue or their places for a given date. The recommendation made in previous reports is accordingly here renewed, that the place of each star should always be given when there is no other means of identification than the name. The number in a designated catalogue, such as that printed with these reports, will of course be a sufficient substitute for the place.

In view of the extended publication proposed for next year, the present report may be made comparatively brief. The names of the observers, their methods of observation, and the abbreviations by which they are designated in Tables I. and II. are mainly the same as in the report for last year; Messrs. Backhouse, Dunér, Eadie, Espin, Gore, Hagen, Knott, Parkhurst, Safarik, and Zaiser, being designated as before by B., D., Ee., En., G., Hn., K., P., Sk., and Zr., while M. denotes the work of the meridian photometer. An eyepiece magnifying 90 times has often been employed in Mr. Parkhurst's observations, in addition to the powers of 56 and 150 mentioned last year. Father Hagen has begun a systematic search for variables of the fourth class in a great circle whose pole is $12^h\ 40^m$, $+28°$, and has examined the DM. chart No. 32 in accordance with suggestions given in "Variable Stars of Short Period." See these Proceedings, XVI. 277, 281. He suspects the following stars to be variable: DM. $+55°$ 2587, $+44°$ 3368, $+44°$ 3402. Dr. Hartwig has not made any statement with regard to his observations in 1886. Professor Safarik has been prevented by illness from making a complete statement of his work, but has sent a list containing a large number of observations, which are entered as usual in Tables I. and II. Statements have also been received from some observers who have not contributed to previous reports. The additional abbreviations thus required in Tables I. and II. are explained in the following paragraphs.

B_1. These observations were made by Mr. Joseph Baxendell, at Birkdale, Southport, England. The telescope used in the observations is an achromatic refractor of 6 inches' aperture, made by Cooke and Sons, of York; and the magnitudes of the variables are determined by comparisons with neighboring stars whose magnitudes have been determined by the method of limiting apertures.

B_2. These observations were made by Mr. Joseph Baxendell, Jr. The place, instrument, and method of observation were the same as described under the heading B_1.

Eq. These observations were made with the equatorial telescope of the Observatory of Harvard College. The aperture and focal length of the instrument are respectively 15 and 279 inches. The magnifying power employed was ordinarily 103. The observers were Messrs. Arthur Searle and O. C. Wendell. The observations consist in measurements, made with the wedge photometer, of the comparison stars known to have been employed by previous observers; but when the variable stars themselves were visible, they were incidentally compared with others by estimate, according to the method of Argelander, and were also observed with the wedge. The work will be continued during the coming year, and it is desired to make it include as many as possible of the comparison stars which have been employed by any observer. The list now in use is chiefly derived from the published work of Argelander, Schönfeld, and Oudemans. Observers are requested to send lists of the comparison stars not included in these publications which they have themselves employed, or which have been employed to their knowledge by others. It is very desirable that not only the places of these stars, but also their designations in the

Durchmusterung, when they occur in that catalogue, should be entered in the lists thus sent.

Sn. These observations were made by Mr. T. S. H. Shearmen, of Brantford, Canada. The instruments employed were an opera-glass and a two-inch refractor. Each variable was compared with stars differing little from it in brightness. Many suspected variables have been photographed.

Table I. indicates the progress of observation for stars included in Table I. of previous reports. Other stars, whether known or suspected to be variable, are included in Table II. All the columns of Table I. except the last are repeated from the statement of the previous year. The first column of the left-hand pages gives a provisional number for designating the star. This number is taken from Schönfeld's Catalogue when the star occurs there; in other cases, a letter is added to the number. The second column contains numbers from the Photometric Catalogue called Harvard Photometry, and published in Volume XIV. of the Annals of the Harvard College Observatory. The following columns contain the usual designation of the star, its right ascension and declination for 1875, magnitude at maximum and minimum, and period in days.

The first column of the right-hand page repeats the number to be used for the provisional designation of the star. The second gives the class to which the star belongs, upon the system of classification employed in the Proceedings of the American Academy of Arts and Sciences, XVI. 257. Upon this system, Class I. includes temporary stars; Class II., stars undergoing large variations in periods of several months; Class III., irregularly variable stars, undergoing but slight changes in brightness; Class IV., variable stars of short period, like β *Lyræ* or δ *Cephei*; Class V., Algol stars, or those which at regular intervals undergo sudden diminutions of light, lasting for a few hours only. The third column gives the name of the discoverer, and the fourth column the date.

The last column contains the number of nights on which each star was observed by the astronomer whose designation is attached to the number. The abbreviations employed have been explained above.

Table I. is followed by a series of remarks containing observed dates of maximum and minimum, and other information derived from the observers with regard to particular stars.

Table II. indicates the progress of observation of stars suspected or known to be variable, but not included in Table I. for reasons explained in previous reports. The provisional numbers given in the first column for many of the stars refer to Mr. Chandler's unpublished catalogue, as in previous years. The second and third columns give the right ascensions and declinations of the stars for 1875. The fourth column gives the number of observations made by each observer, as in the last column of Table I. The abbreviations are likewise the same. The letters in the last column refer to the remarks on page 395.

TABLE I. — VARIABLE STARS.

No.	H.P.	Name.	R. A. 1875.	Dec. 1875.	Max.	Min.	Per.
			h. m. s.	° ′	m.	m.	d.
0a	—	Ceti	0 15 26	—20 45.1	5.2	7.0	—
1	51	T Cassiopeiæ	16 29	+55 5.9	6.5 — 7.0	11 — 11.2	436
2	54	R Andromedæ	17 28	+37 53.0	5.6 — 8.6	<12.8	404.7
3	—	S Ceti	17 42	—10 1.3	7.0 — 8.0	<10.7	323.6
4	—	B Cassiopeiæ	17 52	+63 27.2	>1	?	—
5	—	T Piscium	25 31	+13 54.6	9.5 — 10.2	10.5 — 11.0	Irr.
6	94	α Cassiopeiæ	33 25	+55 51.1	2.2	2.8	Irr.
6a	—	U Cephei	51 18	+81 12.1	7.0	9.5	2.5
7	—	S Cassiopeiæ	1 10 30	+71 57.2	6.7 — 8.5	<13	615
8	—	S Piscium	11 2	+ 8 16.3	8.8 — 9.3	<13	406.6
8a	—	Piscium	16 22	+12 12.7	10	14	—
8b	—	Ceti	19 31	— 4 36.6	6.5	7.8	—
8c	—	R Sculptoris	21 13	—33 11.5	5¾	7¾	207
9	—	R Piscium	24 12	+ 2 14.1	7.4 — 8.3	<12.5	345
10	—	S Arietis	57 55	+11 55.5	9.1 — 9.8	<13	288.8
11	—	R Arietis	2 9 1	+24 28.4	7.6 — 8.5	11.9 — 12.7	186.2
12	370	ο Ceti	13 1	— 3 32.7	1.7 — 5.0	8 — 9	331.3
13	—	S Persei	13 54	+58 0.8	8.5 ?	<9.7	—
14	—	R Ceti	19 39	— 0 44.6	7.9 — 8.7	<12.8	167.1
15	—	T Arietis	41 22	+16 59.3	7.9 — 8.2	9.4 — 9.7	324
16	489	ρ Persei	57 10	+38 21.3	3.4	4.2	Irr.
17	496	β Persei	3 0 2	+40 28.4	2.2	3.7	2.9
18	—	R Persei	22 6	+35 14.3	8.1 — 9.2	12.5	208.8
19	657	λ Tauri	53 45	+12 8.2	3.4	4.2	4.0
20	—	T Tauri	4 14 43	+19 14.3	9.2 — 11.5	12.8 — <	Irr.
21	—	R Tauri	21 27	+ 9 52.9	7.4 — 9.0	<13	325.6
22	—	S Tauri	22 22	+ 9 40.1	9.9	<13	378
22a	—	Doradus	35 19	—62 19.4	5½	6¾	—
23	—	V Tauri	44 48	+17 19.6	8.3 — 9.0	<12.8	168.6
24	—	R Orionis	52 13	+ 7 56.3	8.7 — 8.9	<13	378.8
25	877	ε Aurigæ	53 0	+43 38.2	3.0	4.5	Irr.
26	880	R Leporis	53 55	—14 59.7	6 — 7	8.5 ?	437.8
27	—	R Aurigæ	5 7 12	+53 26.6	6.5 — 7.4	12.5 — 12.7	465
27a	—	S Aurigæ	18 52	+34 2.3	9.4	<13	—
28	—	S Orionis	22 50	— 4 47.5	8.3 ?	<12.3	—
29	1005	δ Orionis	25 37	— 0 23.6	2.2 ?	2.7	Irr.
29a	—	Orionis	29 42	— 5 33.5	10	13	—
30	1091	α Orionis	48 24	+ 7 23.3	1	1.4	Irr.
31	1160	η Geminorum	6 7 20	+22 22.4	3.2	3.7 — 4.2	229.1
31a	—	Monocerotis	16 26	— 2 8.1	7	<10	—
32	1205	T Monocerotis	18 29	+ 7 9.1	6.2	7.6	26.8
33	—	R Monocerotis	32 21	+ 8 50.7	9.5	11.5	Irr.
34	1256	S Monocerotis	34 6	+10 0.5	4.9	5.4	3.4
35	—	R Lyncis	50 59	+55 30.2	9 ?	<12.3	—
36	1334	ζ Geminorum	56 41	+20 45.1	3.7	4.5	10.2
37	—	R Geminorum	59 49	+22 53.8	6.6 — 7.3	<12.3	371.0
38	—	R Canis min.	7 1 50	+10 13.1	7.2 — 7.9	9.5 — 10.0	335.0
38a	—	Puppis	9 43	—44 26.2	3½	<6	135
38b	—	V Geminorum	16 10	+13 21.8	8.5	12 — 13½	276
38c	1417	U Monocerotis	24 50	— 9 31.0	6.0	7.2	46.0
39	—	S Canis min.	25 56	+ 8 35.0	7.2 — 8.0	<11	332.2
40	—	T Canis min.	27 3	+12 0.6	9.1 — 9.7	<13	335.2
40a	—	Canis min.	34 34	+ 8 40.2	8½	13.5	405
41	—	S Geminorum	35 32	+23 44.6	8.2 — 8.7	<13	294.2

TABLE I. — VARIABLE STARS.

No.	Class.	Discoverer.	Date.	Observations, 1886.
0*a*	—	Chandler	1881	3 M.
1	II.	Krüger	1870	8 B_1. 8 Ee. 2 Eq. 9 M. 30 Sk.
2	II.	Argelander	1858	3 Ee. 2 Eq. 3 M. 9 P. 10 Sk.
3	II.	Borelly	1872	9 Ee. 4 Eq. 3 M. 12 P.
4	I.	Tycho Brahe	1572	3 M.
5	II.	Luther	1855	12 Ee. 3 Eq. 4 M. 4 P.
6	III.	Birt	1831	10 M. 1 Sn.
6*a*	V.	Ceraski	1880	1 B_1. 2 B_2. 12 Hn. 1 M.
7	II.	Argelander	1861	2 B_1. 27 B_2. 17 Ee. 2 Eq. 2 G. 6 M. 11 P. 32 Sk.
8	II.	Hind	1851	10 Ee. 2 Eq. 3 M. 6 P.
8*a*	—	Peters	1880	13 P.
8*b*	—	Gould	1874?	2 M.
8*c*	II.	Gould	1872?	—
9	II.	Hind	1850	2 Eq. 3 M. 8 P.
10	II.	Peters	1865	1 Eq. 4 M. 11 P.
11	II.	Argelander	1857	14 B_1. 3 Eq. 9 Hn. 14 P. 2 Sk.
12	II.	Fabricius	1596	50 B. 3 B_1. 22 G. 12 K. 21 Sk. 5 Sn.
13	II.	Krüger	1873	2 Eq. 5 Hn. 1 P. 30 Sk.
14	II.	Argelander	1866	3 Eq. 13 P. 10 Sk.
15	II.	Auwers	1870	3 Eq. 17 Hn. 26 Sk.
16	II.?	Schmidt	1854	1 G.
17	V.	Montanari	1669	—
18	II.	Schönfeld	1861	10 B_1. 3 Eq. 6 Hn. 7 P. 5 Sk.
19	V.	Baxendell	1848	1 B. 9 Zr.
20	—	Hind	1861	8 B_1. 3 Eq. 3 K. 12 P. 2 Sk.
21	II.	Hind	1849	3 Eq. 10 P. 3 Sk.
22	II.	Oudemans	1855	6 Ee. 3 Eq. 11 P. 3 Sk.
22*a*	—	Gould	1874?	—
23	II.	Auwers	1871	3 Eq. 18 P. 12 Sk.
24	II.	Hind	1848	3 Eq. 1 K. 3 Sk.
25	III.	Fritsch	1821	—
26	II.	Schmidt	1855	8 B_1. 2 Eq. 1 K. 17 Sk.
27	II.	At Bonn	1862	2 En. 2 Eq. 4 G. 4 Hn. 1 P. 3 Sk.
27*a*	II.	Dunér	1881	19 D. 4 Eq. 11 P.
28	II.	Webb	1870	9 B_1. 19 Ee. 3 En. 2 Eq. 8 K. 1 P. 24 Sk.
29	III.	J. Herschel	1834	—
29*a*	—	Bond	1863	17 Ee. 1 P.
30	III.	J. Herschel	1836	11 Zr.
31	II.?	Schmidt	1866	2 B.
31*a*	—	Schönfeld	1883	6 P.
32	IV.	Gould	1871	—
33	II.	Schmidt	1861	2 Eq. 1 Sk.
34	IV.	Winnecke	1867	—
35	II.	Krüger	1874	3 Eq. 19 P. 21 Sk.
36	IV.	Schmidt	1844	5 M. 18 Zr.
37	II.	Hind	1848	3 Eq. 2 K. 16 P. 8 Sk.
38	II.	At Bonn	1854	3 Eq. 15 Hn. 1 K. 25 Sk.
38*a*	II.	Gould	1872	—
38*b*	II.	Baxendell	1880	24 B_1. 3 Eq. 6 K.
38*c*	II.?	Gould	1873	11 En. 3 G.
39	II.	Hind	1856	1 B_1. 1 Ee. 3 Eq. 3 K. 19 Sk.
40	II.	Schönfeld	1865	2 Eq.
40*a*	II.	Baxendell	1879	21 B_1. 1 Ee. 1 Eq. 5 K.
41	II.	Hind	1848	2 B_1. 1 Eq. 10 P. 20 Sk.

TABLE I. — *Continued.*

No.	H.P.	Name.	R. A. 1875.	Dec. 1875.	Max.	Min.	Per.
			h. m. s.	° ′	m.	m.	d.
42	—	T Geminorum	7 41 48	+24 2.7	8.1 — 8.7	<13	288.1
42*a*	—	S Puppis	43 6	—47 8.3	7¼	9	—
43	—	U Geminorum	47 41	+22 19.7	8.9 — 9.7	13.1	Irr.
43*a*	—	Puppis	55 0	—12 32	8½	<14	310
44	—	R Cancri	8 9 40	+12 6.5	6.2 — 8.3	<11.7	354.4
45	—	V Cancri	14 36	+17 40.9	6.8 — 7.2	<12	272
46	—	U Cancri	28 37	+19 19.5	8.2 — 10.4	<13	305.7
47	—	S Cancri	36 48	+19 29.0	8.2	9.8	9.5
48	—	S Hydræ	47 3	+ 3 32.4	7.5 — 8.5	<12.2	256.4
49	—	T Cancri	49 32	+20 19.7	8 2 — 8.5	9.3 — 10.5	484.2
50	—	T Hydræ	49 35	— 8 39.8	7.0 — 8.1	<12.5	289.4
50*a*	—	R Carinæ	9 29 6	—62 14.2	4.4	9.3	313
51	—	R Leonis min.	38 4	+35 5.2	6.1 — 7.5	<11.0	374.7
52	1752	R Leonis	40 50	+12 0.5	5.2 — 6.4	9.4 — 10.0	312.6
52*a*	—	l Carinæ	41 49	—61 55.9	3.7	5.2	31.2
52*b*	—	Leonis	53 3	+21 51.6	8½	8.6<13	280?
52*c*	—	Antliæ	10 4 22	—37 7.1	6½	<8	—
52*d*	—	Carinæ	5 23	—60 56.3	6¼	9	—
52*e*	—	U Leonis	17 21	+14 38.1	9½	Inv.	—
52*f*	1869	Hydræ	31 22	—12 44.1	4½	6	—
53	1880	R Ursæ maj.	35 47	+69 25.9	6.0 — 8.1	12	303.4
54	—	η Argus	40 13	—59 1.6	>1	6.3	Irr.
54*a*	—	T Carinæ	50 18	—59 51.2	6.2	6.9	—
55	—	R Crateris	54 25	—17 39.2	>8	<9	—
56	—	S Leonis	11 4 23	+ 6 8.5	9.0 — 9.7	<13	187.6
57	—	T Leonis	32 2	+ 4 3.9	10?	<13	—
58	—	X Virginis	55 27	+ 9 46.1	7.8?	<10	—
59	—	R Comæ	57 51	+19 28.8	7.4 — 8.0	<13	363
60	—	T Virginis	12 8 12	— 5 20.4	8.0 — 8.8	<13	337
61	—	R Corvi	13 10	—18 33.5	6.8 — 7.3	<11.5	318.6
61*a*	—	Virginis	27 26	— 3 43.8	8	14	210±
62	—	T Ursæ maj.	30 42	+60 10.6	7.0 — 8.3	12.2	255.6
63	2147	R Virginis	32 10	+ 7 40.6	6.5 — 7.5	10.0 — 10.9	145.7
63*a*	—	R Muscæ	34 28	—68 43.3	6.6	7.3	0.9
64	—	S Ursæ maj.	38 28	+61 46.7	7.7 — 8.2	10.2 — 11.1	224.8
65	—	U Virginis	44 46	+ 6 14 0	7.7 — 8.1	12.2 — 12.8	207.4
66	—	W Virginis	13 19 35	— 2 43.4	8.7 — 9.2	9.8 — 10.4	17.3
67	—	V Virginis	21 21	— 2 31.4	8.0 — 9.0	<13	251
68	2275	R Hydræ	22 53	—22 38.0	4.0 — 5.5	10?	469.3
69	2289	S Virginis	26 29	— 6 33.0	5.7 — 7.8	12.5	374.0
69*a*	—	Virginis	14 3 37	—12 42.7	9	14	—
69*b*	—	R Centauri	7 35	—59 19.8	6	10	—
70	—	T Bootis	8 14	+19 39.1	9.7?	<13	—
71	—	S Bootis	18 41	+54 22.7	8.1 — 8.5	13.2	272.4
72	—	R Camelopardi	27 8	+84 23.8	7.9 — 8.6	12?	266.2
73	2445	R Bootis	31 41	+27 16.9	5.9 — 7.5	11.3 — 12.2	223.0
73*a*	2459	Bootis	37 56	+27 3.6	5.2	6.1	370?
73*b*	—	Bootis	48 33	+18 12.1	9.1	12.0 — 13.6	173.8
74	2506	δ Libræ	54 18	— 8 1.2	4.9	6.1	2.3
74*a*	—	Libræ	15 3 37	—19 33.9	10	<13.5	700±
74*b*	—	R Triang. Austr.	8 37	—66 2.1	6.6	8.0	3.4
75	—	U Coronæ	13 6	+32 6.4	7.6	8.8	3.5
76	—	S Libræ	14 13	—19 56 1	8.0	12.5?	—
77	—	S Serpentis	15 48	+14 45.9	7.6 — 8.6	12.5?	361.0

TABLE I. — *Continued.*

No.	Class.	Discoverer.	Date.	Observations, 1886.
42	II.	Hind	1848	11 P. 32 Sk.
42*a*	—	Gould	1874?	—
43	II.?	Hind	1855	18 B_1. 26 B_2. 3 Eq. 21 K. 9 P. 45 Sk.
43*a*	II.	Pickering	1881	—
44	II.	Schmidt	1829	1 Ee.
45	II.	Auwers	1870	2 Eq. 12 P. 20 Sk.
46	II.	Chacornac	1853	12 Hn. 5 Sk.
47	V.	Hind	1848	3 Ee. 64 Hn.
48	II.	Hind	1848	6 Sk.
49	II.	Hind	1850	2 En. 2 Eq. 11 P. 19 Sk.
50	II.	Hind	1851	—
50*a*	II.	Gould	1871	—
51	II.	Schönfeld	1863	1 B_1. 2 M. 22 P. 16 Sk.
52	II.	Koch	1782	11 B_1. 2 M. 1 En. 22 Sk. 2 Sn.
52*a*	—	Gould	1871	—
52*b*	II.	Becker	1882	—
52*c*	—	Gould	1872	—
52*d*	—	Gould	1871	—
52*e*	—	Peters	1876	1 Eq. 1 M.
52*f*	—	Gould	1871	3 D. 9 Zr.
53	II.	Pogson	1853	2 B_1. 20 B_2. 5 Eq. 12 K. 4 M. 21 Sk.
54	II.?	Burchell	1827	—
54*a*	—	Thome	1872	—
55	II.	Winnecke	1861	1 B_1. 1 Hn. 2 M. 17 Sk.
56	II.	Chacornac	1856	—
57	II.	Peters	1865	2 M. 5 Sk.
58	II.	Peters	1871	1 Ee. 1 Eq. 2 M.
59	II.	Schönfeld	1856	1 Eq. 1 K. 1 M. 13 P. 1 Sk.
60	II.	Boguslawski	1849	12 Sk.
61	II.	Karlinski	1867	3 Eq. 2 Sk.
61*a*	II.	Henry	—	—
62	II.	Hencke	1856	6 B_1. 27 B_2. 22 Sk.
63	II.	Harding	1809	1 Eq. 10 G.
63*a*	IV.	Gould	1871	—
64	II.	Pogson	1853	22 B_2. 12 K. 8 Sk.
65	II.	Harding	1831	1 Ee. 16 Sk.
66	II.?	Schönfeld	1866	—
67	II.	Goldschmidt	1857	8 P. 3 Sk.
68	II.	Maraldi	1704	9 Sk.
69	II.	Hind	1852	1 Eq. 1 K. 1 Sk.
69*a*	II.	Palisa	1880	1 Eq. 8 P.
69*b*	—	Gould	1871	—
70	I.?	Baxendell	1860	3 M. 22 Sk.
71	II.	At Bonn	1860	3 B_1. 24 B_2. 5 Ee. 20 Hn. 9 P. 10 Sk.
72	II.	Hencke	1858	5 B_1. 29 Ee. 11 P. 36 Sk.
73	II.	At Bonn	1858	7 B_1. 1 Eq. 35 Sk.
73*a*	—	Schmidt	1867	1 G. 10 Zr.
73*b*	II.	Baxendell	1880	11 B_1. 2 Eq.
74	V.	Schmidt	1859	14 Zr.
74*a*	II.	Palisa	1878	1 Eq.
74*b*	IV.?	Gould	1871	—
75	V.	Winnecke	1869	15 Hn.
76	II.	Borelly	1872	1 Eq. 5 P. 5 Sk.
77	II.	Harding	1828	10 Ee. 11 Hn. 2 P. 4 Sk.

TABLE I. — *Continued.*

No.	H.P.	Name.	R. A. 1875.	Dec. 1875.	Max.	Min.	Per.
			h. m. s.	° ′	m.	m.	d.
78	2553	S Coronæ	15 16 18	+31 49.1	6.1 — 7.8	11.9 — 12.5	361.0
78*a*	—	Libræ	34 46	—20 46.5	9	<14	—
79	2639	R Coronæ	43 25	+28 32.5	5.8	13.0	Irr.
80	2647	R Serpentis	44 56	+15 30.8	5.6 — 7.6	<11	357.6
80*a*	—	V Coronæ	45 4	+39 57.0	7.7	12	360.0
81	—	R Libræ	46 32	—15 51.7	9.2 — 10.0	<13	723
82	2678	T Coronæ	54 16	+26 16.5	2.0	9.5	—
83	—	R Herculis	16 0 37	+18 42.5	8.0 — 9.0	<13	319.0
83*a*	—	W Scorpii	4 28	—19 48.6	10	<13	224 3
84	—	T Scorpii	9 36	—22 39.9	7	<10	—
85	—	R Scorpii	10 12	—22 38.2	9 ? — 10.5	<12.5	223
86	—	S Scorpii	10 13	—22 35.2	9.1 — 10.5	<12.5	176.9
86*a*	—	Ophiuchi	14 40	— 7 24.0	9.0	<13.5	326
87	—	U Scorpii	15 16	—17 35.3	9 ?	<12	—
87*a*	—	Ophiuchi	19 46	—12 8.5	7.5	10.5	365
88	—	U Herculis	20 16	+19 10.8	6.6 — 7.7	11.4 — 11.6	408.3
89	2772	g Herculis	24 32	+42 9.6	5	6.2	Irr.
90	—	T Ophiuchi	26 35	—15 51.8	10	<12.5	—
91	—	S Ophiuchi	27 4	—16 53.7	8.3 — 9.0	<12.5	233.8
91*a*	—	W Herculis	30 48	+37 35.6	8.0	<14.5	289
91*b*	—	Ursæ min.	31 40	+72 31.9	8.6	10.5	180 ?
91*c*	—	R Draconis	32 22	+67 0.7	7.2	13<	245.9
92	2828	S Herculis	46 13	+15 9.2	5.9 — 6.8	11.5 — 12.2	303
93	2839	Ophiuchi	52 30	—12 42.0	5.5	12.5	—
93*a*	—	V Herculis	53 41	+35 15.5	9.0	11.7	—
94	—	R Ophiuchi	17 0 36	—15 55.5	7.6 — 8.1	<12	302.4
95	2879	α Herculis	8 57	+14 32.1	3.1	3.9	Irr.
95*a*	2883	U Ophiuchi	10 12	+ 1 21.0	6.1	6.8	0.9
96	2890	u Herculis	12 42	+33 14.1	4.6	5.4	38.5
97	—	Serpentarii	23 9	—21 22.4	>1	?	—
98	2972	X Sagittarii	39 41	—27 46.8	4	6	7.0
99	3035	W Sagittarii	57 2	—29 35.1	5	6.5	7.6
100	—	T Herculis	18 4 22	+31 0.1	7.2 — 8.3	11.4 — 12.1	165.1
101	—	T Serpentis	22 43	+ 6 13.1	9.1 — 10.0	<12.8	342.3
102	—	V Sagittarii	24 4	—18 20.9	7.5?	9.5 ?	—
103	—	U Sagittarii	24 32	—19 12.7	7.0	8.3	6.7
104	—	T Aquilæ	39 45	+ 8 36.9	8.8	9.5	Irr.
105	3176	R Scuti	40 49	— 5 50.2	4.7 — 5.7	6.0 — 8.5	71.1
105*a*	—	κ Pavonis	44 3	—67 23.2	4.0	5.5	9.1
106	3193	β Lyræ	45 28	+33 13.0	3.4	4.5	12.9
107	3224	R Lyræ	51 32	+43 47.1	4.3	4.6	46.0
108	—	S Coron. Aust.	52 43	—37 7.2	9.8	11.5?	6.1
109	—	R Coron. Aust.	53 29	—37 7.2	10.5 — 11.5	<12.5	31
110	—	R Aquilæ	19 0 21	+ 8 2.6	6.4 — 7.4	10.9 — 11.2	345.1
111	—	T Sagittarii	9 1	—17 11.2	7 6 — 8.1	<11	381
112	—	R Sagittarii	9 21	—19 31.5	7.0 — 7.2	<12	270.0
113	—	S Sagittarii	12 7	—19 15.1	9.7 — 10.4	<12.7	230
114	3395	R Cygni	33 28	+49 55.1	5.9 — 8.0	13	425.3
115	—	11 Vulpeculæ	42 26	+27 0.5	3	?	—
116	—	S Vulpeculæ	43 16	+26 58.7	8.4 — 8.2	9.0 — 9.5	67.5
117	3434	χ Cygni	45 46	+32 36.0	4.0 — 6.0	12.8	406.5
118	3436	η Aquilæ	46 6	+ 0 41.2	3.5	4.7	7.2
119	—	S Cygni	20 2 53	+57 37.6	8.8 — 9.5	<13	322.8
120	—	R Capricorni	4 17	—14 38.2	8.8 — 9.7	<13	347

TABLE I. — *Continued.*

No.	Class.	Discoverer.	Date.	Observations, 1886.
78	II.	Hencke	1860	12 B_1. 1 Eq. 1 G. 12 Hn. 6 K. 11 P. 27 Sk.
78*a*	—	Peters	1878	8 P.
79	II.?	Pigott	1795	1 B_1. 1 En. 2 Eq. 3 G. 13 Ee. 15 P. 23 Sk.
80	II.	Harding	1826	1 Eq. 6 Ee. 9 P.
80*a*	II.	Dunér	1878	20 D. 2 Eq. 7 Ee. 13 P. 26 Sk.
81	II.	Pogson	1858	2 K.
82	I.	Birmingham	1866	17 B. 1 Eq. 8 Hn. 1 K. 3 M. 11 Sk.
83	II.	At Bonn	1855	9 Ee. 1 Eq. 7 Hn. 9 P. 11 Sk.
83*a*	II.	J. Palisa	1877	8 P.
84	I.	Auwers	1860	3 M. 8 P.
85	II.	Chacornac	1853	8 K. 8 P.
86	II.	Chacornac	1854	1 K. 8 P.
86*a*	II.	Schönfeld	1881	2 Eq.
87	I.?	Pogson	1863	—
87*a*	—	Dunér	1881	7 D. 1 Eq.
88	II.	Hencke	1860	5 B_1. 1 Eq. 34 Sk.
89	III.	Baxendell	1857	10 Sk.
90	II.	Pogson	1860	3 Eq.
91	II.	Pogson	1854	3 Eq.
91*a*	—	Dunér	1880	14 D. 13 Ee. 1 Eq. 6 Hn. 11 P.
91*b*	II.	Pickering	1881	5 B_1. 22 Ee. 1 K. 2 P. 69 Sk.
91*c*	II.	Geelmuyden	1876	7 B_1. 26 Sk.
92	II.	At Bonn	1856	7 B_1. 1 Eq. 6 Hn. 11 P.
93	I.	Hind	1848	6 M.
93*a*	II.	Baxendell	1880	8 Ee. 2 Eq. 10 P.
94	II.	Pogson	1853	1 Eq.
95	III.	W. Herschel	1795	14 Zr.
95*a*	V.	Sawyer	1881	—
96	III.	Schmidt	1869?	10 Zr.
97	I.	Fabricius	1604	4 M.
98	IV.	Schmidt	1866	—
99	IV.	Schmidt	1866	—
100	II.	At Bonn	1857	11 B_1. 6 Hn. 3 P. 20 Sk.
101	II.	Baxendell	1860	3 B_1. 5 Ee. 2 Eq. 12 Sk.
102	II.	Quirling	1865	2 Eq.
103	IV.	Schmidt	1866	2 Eq.
104	II.	Winnecke	1860	1 Eq. 1 M.
105	II.	Pigott	1795	5 G. 2 M.
105*a*	IV.	Thome	1872	—
106	IV.	Goodricke	1784	16 G. 19 Zr.
107	II.?	Baxendell	1856	—
108	IV.?	Schmidt	1866	2 Eq.
109	II.?	Schmidt	1866	2 Eq.
110	II.	At Bonn	1856	8 Ee. 2 Eq. 6 G. 39 Sk.
111	II.	Pogson	1863	2 Eq. 4 P. 17 Sk.
112	II.	Pogson	1858	2 Eq. 8 P. 10 Sk.
113	II.	Pogson	1860	2 Eq. 8 P. 9 Sk.
114	II.	Pogson	1852	17 B_1. 4 Hn. 1 K. 15 P. 13 Sk.
115	I.	Anthelm	1670	—
116	II.	Hind	1861	10 B_1. 4 Hn.
117	II.	Kirch	1686	13 B_1. 3 G. 15 P. 6 Sk.
118	IV.	Pigott	1784	3 G. 9 Zr.
119	II.	At Bonn	1860	4 B_1. 2 Eq. 8 K. 19 P. 20 Sk.
120	II.	Hind	1848	2 Eq. 4 P.

TABLE I. — *Continued.*

No.	H.P.	Name.	R. A. 1875.	Dec. 1875.	Max.	Min.	Per.
			h. m. s.	° ′	m.	m.	d.
121	—	S Aquilæ	20 5 52	+15 14.9	8.9 — 9.9	10.7 — 11.8	147.2
122	—	R Sagittæ	8 22	+16 21.0	8.5 — 8.7	9.8 — 10.4	70.4
123	—	R Delphini	8 53	+ 8 42.7	7.6 — 8.5	12.8	284.0
124	3547	P Cygni	13 11	+37 38.7	3 — 5	<6	—
125	—	U Cygni	15 44	+47 30.1	7.8 ?	9.8 ?	—
126	3557	R Cephei	19 52	+88 45.0	5 ?	10 ?	—
126*a*	—	— Cygni	37 17	+47 41.8	8	12	423
127	—	S Delphini	37 19	+16 38.4	8.4 — 8.6	10.4 — 11.1	275.6
128	—	T Delphini	39 34	+15 56.7	8.2 — 8.9	<13	331.4
129	—	U Capricorni	41 11	—15 14.4	10.2 — 10.8	<13	203.5
130	3654	T Cygni	42 12	+33 55.0	5.5 ?	6 ?	—
131	—	T Aquarii	43 20	— 5 36.5	6.7 — 7.0	12.4 — 12.7	203.2
132	—	R Vulpeculæ	58 49	+23 19.5	7.5 — 8.5	12.5 — 13.0	137.5
132*a*	—	Capricorni	21 0 19	—24 25.5	9½	14	—
132*b*	—	T Cephei	7 52	+67 58.9	5.6	9.5	382
133	—	T Capricorni	15 6	—15 41.4	8.9 — 9.7	<13	269.4
134	—	S Cephei	36 45	+78 3.6	7.4 — 8.5	11.5	485
134*a*	—	Nova Cygni	37 2	+42 18.2			—
135	3845	μ Cephei	39 41	+58 12.4	4 ?	5 ?	Irr.
136	—	T Pegasi	22 2 48	+11 55.7	8.8 — 9.3	<12.5	367.5
137	3981	δ Cephei	24 32	+57 46.6	3.7	4.9	5.4
137*a*	—	Lacertæ	37 43	+41 43.0	8.6	<13.5	315
138	—	S Aquarii	50 25	—21 0.6	7.7 — 9.1	<11.5	279.4
139	4078	β Pegasi	57 45	+27 24.2	2.2	2.7	Irr.
140	—	R Pegasi	23 0 22	+ 9 52.1	6.9 — 7.7	12 ?	382.0
141	—	S Pegasi	14 14	+ 8 14.2	7.6	<12.2	—
142	4193	R Aquarii	37 21	—15 58.7	5.8 — 8.5	11 ?	388.0
143	4234	R Cassiopeiæ	52 4	+50 41.5	4.8 — 6.8	<12	425.9

REMARKS.

27. Spectrum of type III. En.

27*a*. Max. 1886, March 7; magn. 9.5. In middle of May, magn. 10.5; October 27, magn. 8.7. Variation irregular, or law very complicated. D.

43. Max. 1886, December 1. K.

63. Max. 1886, April 9. G

64. Max. 1886, August 10; magn. 7.7. Min. 1886, Dec. 2; magn. 13.1. K.

80*a*. Period $357^{d}.03$. Magn. at max. 7.2; at min. 10.3. D.

85. Max. 1886, July 28; magn. 9.8. K.

87*a*. Period 309 days (uncertain). Magn. at max. 7.1; at min. 9.6. D.

TABLE I. — *Continued.*

No.	Class.	Discoverer.	Date.	Observations, 1886.
121	II.	Baxendell	1863	29 B$_1$. 18 Ee. 19 K.
122	II.?	Baxendell	1859	29 B$_1$. 24 Ee. 3 Hn.
123	II.	Hencke	1859	2 Eq. 2 Hn. 1 P. 34 Sk.
124	I.	Janson	1600	11 Sk. 11 Zr.
125	II.	Knott	1871	16 B$_1$. 17 Ee. 14 En. 1 Eq. 17 G. 11 K. 39 Sk.
126	II.?	Pogson	1856	6 B$_2$. 16 Ee. 13 Sk.
126*a*	II.	Birmingham	1881	18 B$_1$. 5 En. 9 K. 12 P. 37 Sk.
127	II.	Baxendell	1860	15 B$_1$. 22 Ee. 2 Eq. 10 P. 6 Sk.
128	II.	Baxendell	1863	13 B$_1$. 10 Ee. 1 Eq. 10 K. 7 P. 12 Sk.
129	II.	Pogson	1858	2 Eq. 5 P.
130	—	Schmidt	1864	—
131	II.	Goldschmidt	1861	2 Eq. 19 P.
132	II.	At Bonn	1858	12 Ee. 1 Eq. 15 K. 1 M. 4 P.
132*a*	—	Peters	1867	5 P.
132*b*	II.?	Ceraski	1878	17 Ee. 2 Eq. 21 K. 3 M. 52 Sk.
133	II.	Hind	1854	2 Eq. 4 P.
134	II.	Hencke	1858	20 Ee. 3 M. 56 Sk.
134*a*	I.	Schmidt	1876	4 M.
135	III.?	Hind	1848	70 G. 3 M. 31 Sk. 28 Zr.
136	II.	Hind	1863	3 M. 15 P.
137	IV.	Goodricke	1784	11 G. 28 Zr.
137*a*	—	Deichmüller	1883	2 Eq. 5 M. 9 P.
138	II.	Argelander	1853	2 Eq. 4 M. 7 P. 6 Sk.
139	III.	Schmidt	1847	14 M.
140	II.	Hind	1848	1 Ee. 1 Eq. 12 M.
141	II.	Marth	1864?	1 Eq. 11 M.
142	II.	Harding	1811	2 Eq. 3 M. 6 P. 15 Sk.
143	II.	Pogson	1853	6 B$_1$. 3 D. 7 Ee. 7 G. 10 M. 1 P. 31 Sk.

91*a*. Period 281^{d}.2. Magn. at max. 8.0; at min. 11.5. D.

91*b*. 1886, December 1, magn. 9.1; ruddy. K.

121. Max. 1886, October 4?, magn. 9.2. Min. 1886, July 7?, magn. 11.0; also December 2; magn. 10.75.

125. Max. 1886, September 19. G. — Max. 1886, August 17 ±; magn. 7.9. K.

132. Min. 1886, July 5; magn. 13.6. K.

132*b*. Max. 1886, March 26 ±; magn. 6.2. Min. 1886, October 16; magn. 9.6. K.

135. No well marked max. in 1886. Near min. 1886, August 22 to 28, September 16 to 30, October 1 and 16, and November 1. G.

TABLE II.—ADDITIONAL STARS.

No.	R. A. 1875.	Dec. 1875.	Observations, 1886.	Rem.
	h. m.	° ′		
—	0 35.9	+40 37	4 En. 1 P.	
9	37.8	+ 6 37	14 P.	
—	1 4.4	+ 8 53	1 G.	
21	6.2	+80 53	4 M.	
23	7.7	+34 57	3 M.	
25	15.0	+ 9 2	6 P.	
—	16.4	+ 6 45	3 M.	
31	19.5	— 4 37	5 M.	
37	25.7	— 7 22	4 M.	
—	28.2	+11 55	11 G. 2 M.	A.
43	33.5	—29 40	4 M.	
45	39.1	+ 7 56	5 M.	
47	47.8	+ 8 10	2 B. 1 G. 5 M.	
—	48.9	+22 58	6 G.	
57	2 0.8	— 9 11	4 M.	
59	10.4	+58 22	4 M.	
61	15.2	+54 47	1 G. 4 M.	
63	19.0	+ 9 56	4 M.	
—	19.7	+81 5	6 G.	B.
—	31.9	+49 1	1 G.	
—	52.5	+80 59	7 G.	C.
73	3 37.6	+ 9 0	3 P.	
77	41.8	— 0 17	2 M.	
83	46.9	— 0 52	1 M.	
87	57.8	+23 38	3 P.	
93	4 14.6	+19 31	25 Sk.	
117	5 1 4	— 8 49	4 M.	
123	5.3	+ 0 22	2 M.	
—	5.6	—12 0	1 G.	
—	5.9	—12 2	5 En. 5 Sn.	
129	6.6	— 0 15	3 M.	
135	23.0	— 0 9	4 M.	
—	23.4	— 1 12	5 G.	D.
139	23.8	— 1 8	3 P.	
143	27.4	+21 52	3 M. 4 P.	
145	28.3	+10 10	9 G.	E.
151	29.3	— 3 20	2 M.	
—	35.8	+ 2 18	2 G.	
—	42.5	+37 16	1 G.	
—	48.4	+20 9	14 B_1. 16 B_2. 19 D. 26 Ee. 36 G. 5 Hn. 21 M. 39 P. 22 Sn.	F.
—	56 1	+42 59	8 G.	G.
159	6 10.6	+ 5 8	4 M.	
161	11.2	— 1 32	4 M.	
165	27.9	—27 51	1 G. 1 M.	H.
—	45.1	—27 11	1 G.	I.
—	7 22.0	—11 18	3 G.	J.
177	23.0	— 1 39	3 M.	
179	24.8	— 9 31	3 M.	
—	35.0	+ 3 55	2 G.	
199	55.0	—12 32	3 M.	
205	8 2.4	+19 48	5 P.	
—	48.3	+17 42	1 G.	
—	9 1.2	+15 13	3 M.	

TABLE II. — *Continued.*

No.	R. A. 1875.	Dec. 1875.	Observations, 1886.	Rem.
	h. m.	° ′		
—	9 14.6	+14 52	3 M.	
229	20.1	+14 50	3 M.	
—	21.4	— 8 7	1 G.	
243	30.4	+15 48	3 M.	
—	40.8	+ 7 13	6 G. 3 M.	K.
—	53.2	+ 3 59	2 G.	
—	10 5 3	+13 13	4 M.	
—	11.6	+13 21	3 M.	
—	31.4	—12 30	6 En.	
293	45.5	—20 35	4 M.	
294	47.2	+14 23	11 P.	
303	11 10.0	— 3 22	3 M.	
—	54.5	—18 58	19 Sn.	
311	12 7.5	+ 0 17	4 M.	
315	10.7	+80 49	5 M.	
—	14.1	—21 31	18 Sn.	
—	18.8	+ 1 28	1 G. 2 Sn.	
—	18.8	—10 55	1 G.	
327	24.0	+ 5 6	1 M.	
331	26.9	—19 56	1 M.	
—	32.0	+ 2 33	1 G.	
337	32.7	+17 12	4 M.	
345	37.0	—13 10	1 G.	
—	40.7	+ 6 38	3 G.	
348	44.6	+82 23	1 M.	
361	13 24.0	— 8 55	1 M.	
375	47.8	+11 41	3 M.	
381	56.4	— 1 47	3 M.	
383	58.2	— 8 36	11 P.	
—	14 8.1	+13 33	17 Sn.	
—	8.7	+10 41	18 Sn.	
—	13.3	+ 0 58	2 G.	
—	15.5	— 1 25	8 B.	
—	18.3	+16 53	8 B_1.	
—	24.7	+39 25	22 D. 4 G.	L.
—	29.5	+37 11	1 G.	
407	42.7	+ 6 29	14 Hn.	
—	43.6	+ 8 30	2 G.	
413	45.4	—11 49	3 M.	
429	15 10.7	— 3 43	3 M.	
—	13.0	+27 18	9 G.	M.
437	29.0	—20 45	9 P.	
—	30.7	+15 31	4 G.	
441	30.8	—15 46	5 P.	
—	33.5	+36 39	3 G.	
447	36.5	—10 31	3 M.	
451	39.2	—20 44	8 P.	
—	49.4	—17 57	3 M.	
459	16 1.2	—21 11	9 P.	
—	3.3	+ 1 9	1 G.	
465	9.1	+11 50	3 M.	
471	22.4	—19 14	3 P.	
479	31.7	+72 32	4 M.	
483	44.7	— 5 58	3 M.	

TABLE II. — *Continued.*

No.	R. A. 1875.	Dec. 1875.	Observations, 1886.	Rem.
	h. m.	° ′		
491	16 53.2	— 4 2	3 M.	
503	17 37.6	—18 36	3 M.	
509	18 2.7	+28 44	11 B. 27 Hn.	
517	28.0	+36 54	3 M.	
—	32.4	+ 8 43	17 En. 3 M.	
521	43.1	— 8 3	3 M.	
—	50.0	+ 4 3	9 Zr.	
529	52.8	+14 12	2 M.	
—	55.3	+31 58	1 Sn.	
535	57.7	— 5 52	3 M.	
—	19 3.4	+23 59	8 G.	N.
—	7.6	+ 5 18	3 G.	
—	9.3	+56 39	7 G.	O.
—	16.1	+17 25	12 En.	
545	23.9	+ 2 39	2 G.	
549	27.1	+17 28	11 Ee. 3 M.	
—	28.4	—25 0	2 Sn.	
—	32.3	—23 42	8 Sn.	
—	32.6	—23 43	8 Sn.	
555	35.3	+12 53	11 Ee. 3 G. 3 M.	P.
—	50.3	+16 17	55 En. 71 G. 3 M. 39 Sn.	Q.
—	55.0	—28 3	3 Sn.	
—	20 5.7	+47 29	19 En. 7 M.	
—	6.1	+44 39	- Hn.	
567	7.8	—22 21	9 P.	
—	10.7	+44 39	- Hn.	
—	12.4	+39 59	15 G.	R.
—	21.7	—18 13	3 M.	
—	24.3	+39 34	15 En. 3 M.	S.
—	39.7	+17 38	35 G.	T.
—	41.6	+ 5 32	2 G.	
—	46.1	+27 47	49 G. 55 Sn.	U.
—	49.2	+27 35	5 Sn.	
—	21 0.2	—16 15	3 M.	
601	1.4	—21 51	8 P.	
—	9.6	+59 36	3 G.	V.
—	22.4	+55 58	- Hn	
—	31.3	+44 49	77 G.	W.
—	36.8	+34 56	6 G.	X.
—	40.0	— 2 47	3 En. 1 G.	
613	45.2	+ 6 4	2 M.	
615	56.5	—17 14	7 P.	
—	22 31.7	+57 47	18 M.	
—	47.5	+ 1 11	1 G.	
631	23 1.7	— 7 1	3 M.	
635	14.8	+55 26	4 M.	
645	33.3	— 1 26	3 M.	
—	39.9	+ 2 47	6 En. 4 G.	Y.
651	51.5	— 9 39	12 P.	
653	54.9	+59 40	9 M.	
—	58.1	—11 12	2 G.	

REMARKS.

A. Only slight variation observed. G.
B. Below magn. 8 in all observations. G.
C. Variation of about half a magnitude observed. G.
D. Only slight variation. G.
E. T *Orionis.* Only small variation observed. G.
F. U *Orionis.* Discovered by Gore in 1885.
G. Variation of three or four steps observed. G.
H. Invisible with binocular, March 5, 1886. G.
I. Estimated magn. 7.4, March 5, 1886. G.
J. No variation detected. G.
K. Below magn. 8 in March and April, 1886. It lies south following DM. +7° 2181. G.
L. V *Bootis.* Period $266^d.5$. Magn. at max. 6.7; at min. 9.5. D.
M. Certainly variable to some extent. G.
N. Only slight variation observed. G.
O. Slight variation. G.
P. Magn. 7.5 or 7.6 September 3, 6, and 22. G.
Q. S (10) *Sagittæ.* Maxima, 1886, July 19; August 30; September 7, 15; October 1, 10, 27; November 4, 30; December 16, 25. Minima, June 12; August 8; October 7, 24; November 1, 10; December 4. G.
R. No variation observed. G.
S. Practically invariable. Spectrum of type IV. En.
T. Min. August 29±. G.
U. T *Vulpeculæ.* Near max. 1886, September 14, 27; October 10; November 10, 15; December 16, 24. Min. 1886, August 29. G.
V. Estimated magn. 7.3, 1886, September 2 and 8. G.
W. W *Cygni.* Max. 1886, May 19, August 28±. Min. 1886, Feb. 14±. G.
X. Only slight variation observed. G.
Y. Nearly equal to κ on September 15. En. Near max. September 15. G.

Professor Safarik has made 12 observations of the minor planet Vesta, in continuation of his interesting researches upon the light of asteroids, mentioned at the close of the report made last year.